For submission to the Australian Journal of Emergency Management

Disaster Waste Management following the 2009 Victorian Bushfires

Charlotte Brown
Mark Milke
Erica Seville

Abstract

The 2009 Black Saturday Bushfires in Victoria, Australia, killed 173 people and affected 430,000 hectares of land. Before communities could begin to rebuild, tonnes of burnt and potentially hazardous debris had to be removed. Although largely unprepared for a disaster of this scale, there was a collective response to move with urgency towards a common goal: to remove public health hazards and to get communities into the rebuilding process as quickly as possible. Five key decisions were made during the clean-up process: the establishment of the (Victorian Bushfire Recovery and Reconstruction Authority); full government funding for building demolition; the single waste classification; the appointment of a single contract and the construction of a new landfill cell. For each key decision the following are analysed: the decision-making process: delays: organisational considerations: legal implications; and environmental, economic and social effects. Overall the demolition and debris removal response was successful, however, authorities need to plan for their response in future events, which may require an entirely different response. Planning is necessary to give decision-makers the tools and information necessary to make timely, effective and coordinated decisions after any given event.

1 Introduction

The 7 February 2009 "Black Saturday" bushfires in Victoria, Australia, were the most devastating bushfires in Australian history. 173 people were killed in 78 communities and over 430,000 hectares of land and 2000 properties were destroyed (VBRRA, 2009).

Due to the intense heat of the fires (up to 1200°C) (Victorian Bushfires Royal Commission, 2009), many of the affected buildings were reduced to a pile of twisted metal, masonry rubble and ash. The waste matrix included: mixed ash; concrete rubble and bricks; partially burnt dimensional timber and fence posts (treated); metal; vegetation and trees; corpses (removed by the Coroner); household hazardous wastes (including asbestos); and vehicles. The Commonwealth and State governments elected to pay for and facilitate demolition and removal of all building related debris in the affected areas.

This research looks at the waste management process during the recovery phase of the bushfire response. This case study will be used by the authors as part of a wider study on disaster waste management systems. The aim of the wider study is to develop a strategic and integrated approach to planning for and responding to disaster waste.

There is a full length case study report available at www.resorgs.org.nz.

2 Disaster Waste Management Background

Depending on their type and severity, and the nature of the built environment, disasters can create large volumes of inert and hazardous debris. Recent natural disasters such as the 2010 Haiti earthquake (Booth, 2010, Johnson and Correa, 2010, Kahn, 2010), Hurricane Katrina 2005 (Luther, 2008, USEPA, 2008, Brown and Milke, 2009),and the 2004 Indian Ocean tsunami (Basnayake et al., 2005, Petersen, 2006) have all generated volumes of waste which overwhelmed existing solid waste capacities and required extraordinary management approaches.

Disaster debris can impede rescuers and emergency services reaching survivors; inhibit provision of lifeline support; pose a public and environmental health hazard; and hinder the social and economic recovery of the affected area. Poor management of a clean-up effort can result in a slow and costly recovery which is potentially risky to public and environmental health in both the short and long term.

Due to the destructive nature of fires, there is typically less debris than other disasters (USEPA, 1995). There are few documented accounts of waste management following fire events, those reported include the 1991 Oakland firestorm (State of California, 1997), 1993 Malibu, California, coastal fires (USEPA, 1995), 2000 Cerro Grande wildfires (USEPA, 2008) and 2003 Cedar and Pines Fires, San Diego (County of San Diego, 2005). Responses to debris management following these fires were varied in their assessment of environmental and public health hazards associated with management of the

debris. Consequently a range of management options were employed during the responses, including private property clearance by property owners; local government facilitated cleanups; a combination of insurance, federal and local government funding; and mixed efforts to recycle.

The first and most comprehensive national guidance on disaster debris management was the USEPA's "Planning for Disaster Debris" (USEPA, 1995) which was updated in 2008 (USEPA, 2008). Outside the US the understanding of the need to plan for debris management is growing (Johnston et al., 2009, JEU, 2010).

3 Methodology

3.1 Interviews

Interviews were held with professionals and community members either involved in or affected by the waste management following the Bushfires. The interviews were carried out in August 2009 and March 2010, six and 13 months after Black Saturday respectively.

In total, eight professionals (including contractors, private waste firms, council waste managers, government regulators and disaster managers) and 14 community members were interviewed using a semi-structured interview approach.

3.2 **Analysis**

The analysis focuses on the decision points in the waste management programme. Decision points determine the path and in turn overall success of a process. In order for lessons to be learnt that can help position communities to respond better in the future, it is important to understand and anticipate what decisions will have to be made, how to better make these decisions and what information is needed to do so. The analysis was informed by the both the interviews and the study of pre and post-disaster literature.

For each key decision identified the analysis focused on: the decision-making process; the delays associated with the decision; the organisational aspects of the decision; the legal constraints; and the environmental, economic and social effects.

4 Analysis

A flow diagram summarising the decision-making associated with the waste management process is shown in Figure 4.1. The diagram is a chronological account (although not to scale) and shows the events that occurred (star shape), the activities that took place (rectangular boxes), the decisions that were made (diamonds) and any delays that occurred (a pair of vertical parallel lines). The diagram is also split into 3 levels (local authority, state government and individual) to indicate who undertook the decisions and/or activities. Arrows are used to show the flow through the diagram.

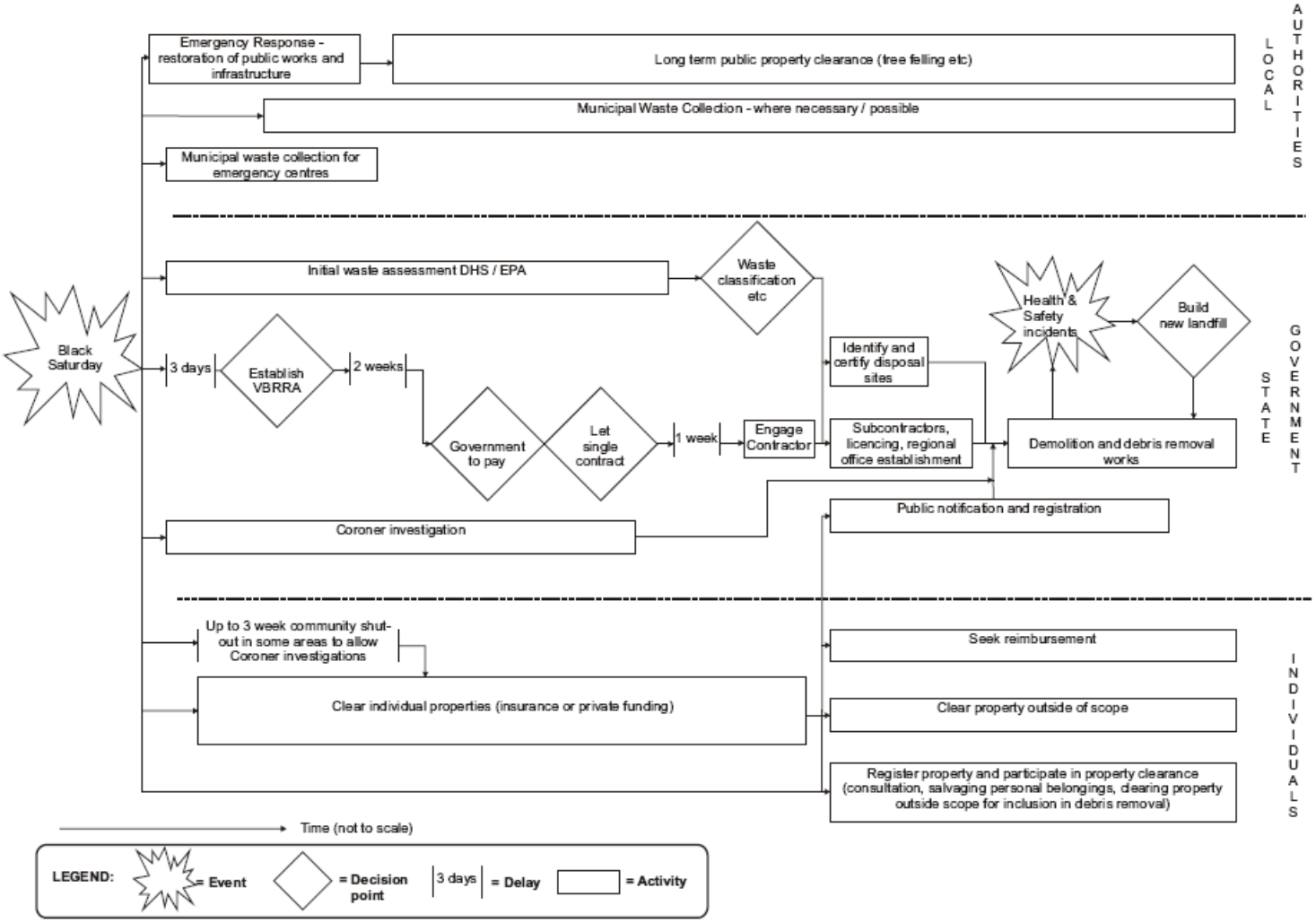
LOCAL AUTHORITIES
STATE GOVERNMENT
INDIVIDUALS
Emergency Response - restoration of public works and infrastructure
Long term public property clearance (tree felling etc)
Municipal Waste Collection - where necessary / possible
Municipal waste collection for emergency centres
Black Saturday
Initial waste assessment DHS / EPA
Waste classification etc
3 days
Establish VBRRA
2 weeks
Government to pay
Let single contract
1 week
Engage Contractor
Identify and certify disposal sites
Subcontractors, licencing, regional office establishment
Health & Safety incidents
Build new landfill
Demolition and debris removal works
Coroner investigation
Public notification and registration
Up to 3 week community shut-out in some areas to allow Coroner investigations
Clear individual properties (insurance or private funding)
Seek reimbursement
Clear property outside of scope
Register property and participate in property clearance (consultation, salvaging personal belongings, clearing property outside scope for inclusion in debris removal)
Time (not to scale)
LEGEND:
= Event
= Decision point
3 days
= Delay
= Activity

Figure 4.1 2009 Victorian Bushfires waste management decision flow chart

4.1 Decision 1: Establishment of VBRRA

Due to the scale of the disaster, the Commonwealth and Victorian Governments elected to establish the Victorian Bushfire Recovery and Reconstruction Authority (VBRRA) to "guide the recovery and rebuild process" (VBRRA, accessed 2010). The decision to form this authority was not directly related to management of the bushfire waste, however, it is included here as VBRRA forms the umbrella of the entire disaster recovery system which debris management forms a part.

Overall the timely establishment of VBRRA played a positive role in the waste management process. VBRRA took overall responsibility for the waste management programme, gave a focal point to the community for waste management issues and initiated the coordination of the appropriate regulators and contractors to implement the project. The main weakness of this approach was the limited longitudinal involvement of specialised waste management personnel in strategic development. . If VBRRA had not been established, waste management would have been the responsibility of the already overwhelmed local government authorities.

4.2 Decision 2: Government funding

Two weeks after Black Saturday, the Commonwealth and State Government of Victoria elected to jointly pay for and facilitate the demolition and debris disposal of private and public buildings destroyed by the bushfires – a

responsibility which would ordinarily rest with private property owners and municipalities, respectively.

The justification for this decision was to clear debris and hazardous materials from bushfire affected properties and to help start people rebuilding (The Premier of Victoria, 2009) and in turn benefit the economic recovery of the community.

The decision required political and financial support which took time to establish. However, if no funding had been provided significant delays in the demolition and debris removal would have arisen. In particular, it would take time for insurance payouts, charitable donations and possibly government grants to be assessed and awarded before individual property owners could facilitate clean-up works. These delays would also have potentially exacerbated any negative environmental, social and economic impacts.

In general, government funding of private property demolition and debris removal was very successful. The initiative had the desired effect of facilitating a timely and well coordinated community wide clean-up operation. The two major disadvantages of the government funding. The first is the potential for setting a funding precedence for future disasters such that the community expect government assistance and do not insure for management of disaster waste. The second is the limited scope of the government funding programme. Individual property owners were responsible for any clean-up works outside the scope of the Grocon contract, however, there was also a general reluctance to carry out the work and an expectation that the

government should or would provide additional funding. There were also reported instances of illegal dumping from residents unwilling to pay the high disposal costs. Limited systems were not put in place to ensure residents were aware of their responsibilities and were in a position to manage the waste in an appropriate manner.

4.3 Decision 3: Single waste classification and management procedures

To expedite debris removal and minimise hazards to people and the environment, the Victorian Environmental Protection Agency (EPA) and the Department of Human Services (DHS) elected to classify all bushfire waste as a single classification. The classification assumed the waste was Construction & Demolition waste plus other contaminants, including Class B (non-friable) asbestos. Provisions under Section 30A of the Victorian Environmental Protection Act, 1970 and Section 55 of the Dangerous Goods Act (Victorian Government Gazette, 2009), 1985 were activated to formalise the classification. The combined regulations stipulated stream-lined handling, transportation and disposal methods for management of the bushfire waste.

Coroner investigations in the affected area and the time taken to decide that the government would fund the clean-up meant EPA and DHS had approximately four weeks to establish processes for waste handling, transportation and disposal. However, in another event, a four week delay in establishing waste management procedures may not be acceptable, especially if significant acute hazards existed in the waste matrix and threatened residents. If no over-arching classification had been made, each site would

have had to be independently assessed or tested for contaminants causing significant delays, public concern and increased disposal costs (for contaminated materials).

The single waste classification expedited the speed of the cleanup works with both minimal environmental and health and safety risk to waste handlers and the public. The legal arrangements that allowed for the waste classification were straightforward to implement and effective despite the absence of clear guidance on how emergency waivers should be assessed.

4.4 Decision 4: Centralised demolition and debris removal contract

Three weeks after Black Saturday, the State government let a single "managing contract" to coordinate and to manage subcontractors for demolition and debris removal works. The contract included all public and private buildings destroyed in the bushfires. Individual property owners were not required to participate, other than salvaging of personal belongings if desired.

The contract was awarded to an Australian building contractor called Grocon. Approximately 70% of subcontracts (and 50% of the labour) were sourced from the local community.

Despite the initial delays associated with letting the contract (which were in parallel with Coronary investigations), the centralised demolition and debris removal contract accelerated waste removal and demolition works and led to

quality work. If property owners had been required to facilitate their own clean-up, it would have been extremely difficult to ensure rapid and safe debris removal .

The majority of respondents agreed that the centralised demolition and debris removal contract, implemented by Grocon, for debris removal was a success. The centralised demolition and debris removal contract allowed for efficient removal (within the six month completion target) and streamlined and consistent health and safety and environmental procedures across all affected areas. Organisational structures were simple and economy of scale for the physical works (including resource allocation) was also possible. The major drawback to the centralised demolition and debris removal contract was the limited community consultation and use of non-local labour.

4.5 Decision 5: Construction of a new landfill cell

The majority of the bushfire waste went to existing municipal waste landfills a significant distance from the affected area. However, due to several incidents involving waste-laden trucks travelling on a dangerous stretch of road, an urgency developed to find an alternate disposal site. A landfill cell at an existing landfill site (owned by Murrindindi Shire) was identified. A landfill cell was designed (at a lower specification than other landfills receiving the bushfire waste), consented and constructed in just 10 days. After construction and operation of the cell by Grocon, it was capped and handed back to Murrindindi Shire. The 30 year maintenance requirements for the landfill cell remain with the Shire.

The essence of this decision is whether or not an additional facility with a potentially higher environmental risk, should have been used to reduce an occupational health and safety hazard. It is unclear how these potential effects were assessed, traded-off and justified and who carries the liability for this decision.

The fast design, construction and consenting process showed good collaboration between organisations. The new landfill significantly reduced health and safety risk to the public and the truck drivers and reduced haulage costs. However, the execution of the new landfill siting and consenting could have been improved. The assessment process and justification for the reduced environmental standards (based on a health and safety risk) was unclear and seemingly undocumented. In addition, the expedited processes used for consenting has the potential to introduce future liability issues at the site.

4.6 Communication

An overriding theme within all the above decisions is communication, including: gathering information to assist in decision-making; facilitating decision-making (inter-agency communication); informing the public on how decisions were made; and educating on individual's responsibilities.

In general, the inter-agency communication was reactionary – due to the absence of a plan - but effective. Roles and responsibilities were undefined and overall responsibilities for various aspects of the waste management process were unclear.

Communication of the waste management decisions with the public, however, was less effective. The State Emergency Recovery Plan (Emergency Management in Victoria, 2005) outlines that community communication plans should be established 'as soon as practicable' in the recovery process. Despite this no community-wide consultation was carried out prior to establishment or during implementation of the clean-up programme.

Effective communication may have short-circuited some of the community dissatisfaction. Health and safety concerns and potential environmental impacts would have also been mitigated for individual clean-up operations.

5 Discussion

One common theme from the interviews was a general reluctance to plan for waste management for disasters, There are several possible reasons for this viewpoint:

- The perceived difficulty in planning for the unknown.
- The low probability of such large scale disasters.
- The success of this particular debris management process (implemented without a plan in place).

Despite the relatively effective reactionary waste management response following this event, waste management planning is needed to reduce waste's lingering impacts (Solis et al., 1995, Reinhart and McCreanor, 1999, USEPA,

2008). A key step to improve disaster waste management is, consequently, transcending the paradigm that planning is not possible or useful.

The key to flexible and transferable disaster waste management plans is to develop the plan around decision points. This can be achieved by anticipating: what decisions will need to be made; who should make the decision; what information will be needed; how the decision will be made; and how the decision will be communicated and then implemented. This approach is considered more effective than instituting operational plans which may not be appropriate for every disaster situation.

6 Recommendations

In the Victorian context, the first and most important step is to prepare disaster waste management plans at municipal level. The plans must include clear pre and post disaster consultation and communication strategies. The plans should:

- Establish an organisational structure with roles and responsibilities, and decision-making delegation that fits within the overall recovery framework. This should include solid waste professionals and community representatives.
- Determine a funding policy - a tiered approach based on disaster impact. Private property owner and government responsibilities should be well defined and the role of insurance included.
- Establish maximum acceptable environmental and health and safety risks for different levels of disaster impact and methods of assessing

those risks. Consider whether legal provisions need to be bounded to reflect these standards.

- Establish a strategy for the physical works, alongside the tiered funding strategy above. Consider state and local responses, property owner roles and responsibilities, contractor involvement and local labour use.

7 Acknowledgements

I would like to thank all the interviewees for sparing their valuable time. Everyone recognised the need to learn from the experiences following the Victorian Bushfires. Thanks to: Tim Bamford (VBRRA), Frank Bortoletto (Grocon), Myles Whelan (Victoria EPA), Grant Jack (Shire of Yarra Ranges), Ben Harries (City of Whittlesea), Michael O'Keeffe (Sita Environmental Solutions), Matt Nind (Transpacific Industries), Darren Ritchie (Murrindindi Shire Council), Ben Hardman (State Member for Seymour), Fran Bailey (Federal MP for McEwen), Dr. Lachlan Fraser (for photos) and all the community members who assisted me in my research.

The reconnaissance would also not have been possible without funding from the Resilient Organisations research programme (a collaboration between University of Canterbury, University of Auckland and Kestrel Group and funded by Foundation for Research, Science and Technology) and the University of Canterbury, Department of Civil and Natural Resources Engineering.

8 References

Basnayake, B. F. A., Chiemchaisri, C. & Mowjood, M. I. M. (2005), Solid wastes arise from the Asian Tsunami Disaster and their Rehabilitation Activities: Case Study of Affected Coastal Belts in Sri Lanka and Thailand. Tenth International Waste Management and Landfill Symposium, Sardinia.

Booth, W. (2010) Haiti faces colossal and costly cleanup before it can rebuild. *The Washington Post.* Haiti.

Brown, C. & Milke, M. (2009), Planning for Disaster Debris Management. WasteMINZ Conference, 14-16 October 2009, Christchurch, New Zealand.

County of San Diego (2005), Debris Removal and Recycling Programs for the 2003 Cedar and Paradise Fires, County of San Diego, Department of Public Works, Solid Waste Planning and Recycling, San Diego.

Emergency Management in Victoria (2005), Part 4 - State Emergency Recovery Arrangements, Emergency Management Manual Victoria, Office of the Emergency Services Commissioner,

Jackson, N. M. (2008) Cleaning up after Mother Nature. *Waste Age,* **July 2008,** 3.

JEU (2010), Joint Environmental Unit Disaster Waste Management Guidelines,
Johnson, K. & Correa, C. (2010), "Haiti President: Three Years to Move Rubbble", available at: http://www.time.com/time/world/article/0,8599,1964426,00.html (accessed 23 February 2010)
Johnston, D., Dolan, L., Glavovic, B., Schalkwyk, R. v., Killeen, C., Cousins, J., Saunders, W., Becker, J., McIntyre, I. & Brown, C. (2009), Disposal of debris following urban earthquakes: guiding the development of comprehensive pre-event plans Institute of Geological and Nuclear Sciences Limited,, Wellington.
Kahn, C. (2010) Haiti Seeks a Home For An Endless Sea of Debris.
Luther, L. (2008), Disaster Debris Removal After Hurricane Katrina: Status and Associated Issues, Congressional Research Service,
Petersen, M. (2006) Wasting away - the post-tsunami menace. *Materials World,* **January 2006,** 20-22.
Reinhart & McCreanor (1999), Disaster Debris Management - Planning Tools,
Skinner, J. H. (1995) Conclusions. *Earthquake Waste Symposium*. Osaka.
Solis, G. Y., Hightower, H. C., Sussex, J. & Kawaguchi, J. (1995), Disaster Debris Management, The Disaster Preparedness Resources Centre, The University of British Columbia for Emergency Preparedness Canada, British Columbia.
State of California (1997) Integrated Waste Management Disaster Plan: Guidance for local government on disaster debris management. Integrated Waste Management Board (Ed.).
The Premier of Victoria (2009), "Thousands of properties to be cleared during bushfire clean-up", available at: http://www.premier.vic.gov.au/premier/thousands-of-properties-to-be-cleared-during-bushfire-clean-up.html (accessed 09 September 2009)
USEPA (1995) Planning for Disaster Debris. Wastes Department (Ed.).
USEPA (2008) Planning for Natural Disaster Debris Office of Solid Waste and Emergency Response & Office of Solid Waste (Eds.).
VBRRA (2009), 100 Day Report, Victorian Bushfire Reconstruction and Recovery Authority,,
VBRRA (accessed 2010), "About the Victorian Bushfire Reconstruction and Recovery Authority", available at: http://www.wewillrebuild.vic.gov.au/about-us.html (accessed
Victorian Bushfires Royal Commission (2009), Interim Report,
Victorian Government Gazette (2009) Order concerning the removal of asbestos from premises damaged in the 2009 Victorian Bushfires. Finance WorkCover and the Transport Accident Commission (Ed.).
WRCDEMG (2008) Group Debris Disposal Guidelines. Wellington Region Civil Defence Emergency Management Group (Ed.). Wellington.